



9810089_final.txt

SEQUENCE LISTING

<110> Dan Nilsson
 Thomas Janzen
 <120> Method of preventing bacteriophage
 infection of bacterial cultures

 <130> 21134 PC 1
 <150> PA 1998 00878
 <151> 1998-07-03
 <150> US 60/091,735
 <151> 1998-07-06
 <160> 6
 <170> FastSEQ for Windows Version 3.0

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 <223> PCR-primer for the construction of plasmid with
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 <212> DNA
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 <212> DNA
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<210> 7
 <211> 4815
 <212> DNA
 <213> Lactococcus lactis subsp. cremoris
 <213> STRAIN: MG1363
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 AGT AAA GCT TTA CTT GAG GTC GCC CGA GAA AAA GGA CAA CTT GAA GCA 100
 Ser Lys Ala Leu Leu Glu Val Ala Arg Glu Lys Gly Gln Leu Glu Ala
 10 15 20 25
 ATT CTT ACT GAA GTT AGC GAA ATG ATT CAG CTT TTC AAA GAA AAT AAC 148
 Ile Leu Thr Glu Val Ser Glu Met Ile Gln Leu Phe Lys Glu Asn Asn
 30 35 40
 TTA GGT GCT TTT TTA GCA AAT GAA GTT TAT TCA TTC TCT GCT AAA TCT 196
 Leu Gly Ala Phe Leu Ala Asn Glu Val Tyr Ser Phe Ser Ala Lys Ser
 45 50 55
 GAA TTG ATT GAT ACT TTG CTT CAA ACT TCA TCA GAA GTG ATG TCA AAT 244
 Glu Leu Ile Asp Thr Leu Leu Gln Thr Ser Ser Glu Val Met Ser Asn
 60 65 70
 TTC CTG AAT ACT ATT CGT TCT AAT GGA CGT CTA GCT GAC CTC GGA GAA 292
 Phe Leu Asn Thr Ile Arg Ser Asn Gly Arg Leu Ala Asp Leu Gly Glu
 75 80 85
 ATA CTT GAA GAA ACT AAA AAT GCA GCA GAT GAC ATG TTC AAA ATT GCT 340
 Ile Leu Glu Glu Thr Lys Asn Ala Ala Asp Met Phe Lys Ile Ala
 90 95 100 105
 GAC GTT GAA GTT GTT TCA AGT ATT GCA TTG TCA GAA GCT CAA ATT GAA 388
 Asp Val Glu Val Val Ser Ser Ile Ala Leu Ser Glu Ala Gln Ile Glu
 110 115 120
 AAA TTT AAA GCA ATG GCT AAA TCA AAA TTT GAT TTA AAC GAA GTA ACA 436
 Lys Phe Lys Ala Met Ala Lys Ser Lys Phe Asp Leu Asn Glu Val Thr
 125 130 135
 GTA ATT AAT ACA GTC AAT GAA AAA ATT CTC GGA GGA TTC ATT GTG AAC 484
 Val Ile Asn Thr Val Asn Glu Lys Ile Leu Gly Gly Phe Ile Val Asn
 140 145 150
 TCT CGT GGA AAA ATT ATT GAC GCC TCA TTA AAA ACA CAA TTG GCT AAA 532
 Ser Arg Gly Lys Ile Ile Asp Ala Ser Leu Lys Thr Gln Leu Ala Lys
 155 160 165
 ATC GCC GCT GAA ATC CTC TAATCAGGAT AGAAAAATTT TCTTCCTTTG 580
 Ile Ala Ala Glu Ile Leu
 170 175
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 GGTAATTTTA AACTTTGCTT ATTCATGCTC AAAAAGTATA ACTGCAGTTT AAAGCTAAAT 700
 AGCCTTGAAC TAGTAAAAAA TTTCTAGAAG GGAGCATATT T TTG GCA ATT AAA 753
 Leu Ala Ile Lys
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 GCT AAT GAA ATC AGC TCA CTG ATT AAA AAA CAA ATT GAA AAT TTC ACA 801
 Ala Asn Glu Ile Ser Ser Leu Ile Lys Lys Gln Ile Glu Asn Phe Thr

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5	CCA	GAT	TTT	GAA	GTT	GCT	GAA	ACT	GGT	GTC	GTT	ACC	TAT	GTT	GGT	GAT	849
	Pro	Asp	Phe	Glu	Val	Ala	Glu	Thr	Gly	Val	Val	Thr	Tyr	Val	Gly	Asp	
					25					30					35		
	GGT	ATC	GCG	CGT	GCC	TAT	GGC	CTT	GAA	AAT	GCG	ATG	AGC	GGT	GAG	CTT	897
	Gly	Ile	Ala	Arg	Ala	Tyr	Gly	Leu	Glu	Asn	Ala	Met	Ser	Gly	Glu	Leu	
				40					45					50			
	GTT	GAG	TTT	TCA	AAT	GGT	ATA	CTT	GGT	ATG	GCG	CAA	AAC	TTG	GAT	GCT	945
	Val	Glu	Phe	Ser	Asn	Gly	Ile	Leu	Gly	Met	Ala	Gln	Asn	Leu	Asp	Ala	
				55				60					65				
	ACA	GAC	GTT	GGT	ATT	ATC	GTA	CTT	GGT	GAT	TTC	CTC	TCA	ATT	CGT	GAA	993
	Thr	Asp	Val	Gly	Ile	Ile	Val	Leu	Gly	Asp	Phe	Leu	Ser	Ile	Arg	Glu	
		70				75					80						
	GGT	GAC	ACT	GTT	AAA	CGT	ACA	GGT	AAA	ATC	ATG	GAA	ATC	CAA	GTT	GGT	1041
	Gly	Asp	Thr	Val	Lys	Arg	Thr	Gly	Lys	Ile	Met	Glu	Ile	Gln	Val	Gly	
	85				90						95				100		
	GAA	GAA	CTC	ATC	GGA	CGT	GTT	GTA	AAC	CCA	CTT	GGA	CAA	CCC	GTT	GAT	1089
	Glu	Glu	Leu	Ile	Gly	Arg	Val	Val	Asn	Pro	Leu	Gly	Gln	Pro	Val	Asp	
					105					110					115		
	GGA	CTT	GGA	GAA	CTT	AAT	ACA	GGT	AAA	ACT	CGT	CCA	GTT	GAA	GCA	AAA	1137
	Gly	Leu	Gly	Glu	Leu	Asn	Thr	Gly	Lys	Thr	Arg	Pro	Val	Glu	Ala	Lys	
				120					125					130			
	GCT	CCT	GGT	GTT	ATG	CAA	CGT	AAA	TCA	GTC	TCT	GAG	CCA	TTA	CAA	ACT	1185
	Ala	Pro	Gly	Val	Met	Gln	Arg	Lys	Ser	Val	Ser	Glu	Pro	Leu	Gln	Thr	
			135				140					145					
	GGT	CTT	AAA	GCG	ATT	GAT	GCC	CTC	GTT	CCA	ATT	GGA	CGT	GGA	CAA	CGT	1233
	Gly	Leu	Lys	Ala	Ile	Asp	Ala	Leu	Val	Pro	Ile	Gly	Arg	Gly	Gln	Arg	
	150					155					160						
	GAA	TTA	ATT	ATC	GGA	GAC	CGT	CAA	ACT	GGT	AAA	ACT	TCA	GTC	GCT	ATT	1281
	Glu	Leu	Ile	Ile	Gly	Asp	Arg	Gln	Thr	Gly	Lys	Thr	Ser	Val	Ala	Ile	
	165				170					175					180		
	GAT	GCA	ATC	TTG	AAC	CAA	AAA	GGT	CAA	GAT	ATG	ATT	TGT	ATC	TAT	GTT	1329
	Asp	Ala	Ile	Leu	Asn	Gln	Lys	Gly	Gln	Asp	Met	Ile	Cys	Ile	Tyr	Val	
					185					190					195		
	GCG	ATT	GGA	CAA	AAA	GAG	TCA	ACA	GTT	CGT	ACA	CAA	GTT	GAA	ACG	CTC	1377
	Ala	Ile	Gly	Gln	Lys	Glu	Ser	Thr	Val	Arg	Thr	Gln	Val	Glu	Thr	Leu	
				200					205					210			
	CGT	AAA	CTC	GGT	GCG	ATG	GAT	TAT	ACA	ATC	GTC	GTA	ACT	GCG	TCA	GCT	1425
	Arg	Lys	Leu	Gly	Ala	Met	Asp	Tyr	Thr	Ile	Val	Val	Thr	Ala	Ser	Ala	
				215				220					225				
	TCT	CAA	CCT	TCT	CCA	CTC	CTT	TAC	ATC	GCT	CCT	TAC	GCT	GGA	GCT	GCA	1473
	Ser	Gln	Pro	Ser	Pro	Leu	Leu	Tyr	Ile	Ala	Pro	Tyr	Ala	Gly	Ala	Ala	
		230				235					240						
	ATG	GGT	GAA	GAA	TTT	ATG	TAT	AAC	GGT	AAA	CAT	GTC	TTG	GTT	GTT	TAT	1521
	Met	Gly	Glu	Glu	Phe	Met	Tyr	Asn	Gly	Lys	His	Val	Leu	Val	Val	Tyr	
	245				250					255				260			
	GAT	GAT	TTA	TCT	AAA	CAA	GCG	GTC	GCT	TAC	CGT	GAA	CTT	TCT	CTC	TTG	1569
	Asp	Asp	Leu	Ser	Lys	Gln	Ala	Val	Ala	Tyr	Arg	Glu	Leu	Ser	Leu	Leu	
				265					270					275			
	CTC	CGT	CGT	CCA	CCA	GGT	CGT	GAA	GCA	TAC	CCA	GGT	GAC	GTT	TTC	TAC	1617
	Leu	Arg	Arg	Pro	Pro	Gly	Arg	Glu	Ala	Tyr	Pro	Gly	Asp	Val	Phe	Tyr	
				280					285					290			
	TTG	CAC	TCA	CGT	CTT	TTG	GAA	CGT	GCT	GCT	AAA	TTG	TCT	GAT	GAT	CTT	1665
	Leu	His	Ser	Arg	Leu	Leu	Glu	Arg	Ala	Ala	Lys	Leu	Ser	Asp	Asp	Leu	
			295				300					305					
	GGT	GGT	GGA	TCA	ATG	ACG	GCT	TTG	CCA	TTC	ATT	GAA	ACA	CAA	GCA	GGT	1713
	Gly	Gly	Gly	Ser	Met	Thr	Ala	Leu	Pro	Phe	Ile	Glu	Thr	Gln	Ala	Gly	
		310				315						320					
	GAT	ATC	TCA	GCT	TAT	ATT	CCA	ACA	AAC	GTT	ATC	TCT	ATT	ACC	GAC	GGT	1761
	Asp	Ile	Ser	Ala	Tyr	Ile	Pro	Thr	Asn	Val	Ile	Ser	Ile	Thr	Asp	Gly	
	325				330					335					340		
	CAA	ATT	TTC	CTT	GAA	AAT	GAC	TTG	TTC	TAT	TCA	GGT	GTA	CGT	CCT	GCC	1809
	Gln	Ile	Phe	Leu	Glu	Asn	Asp	Leu	Phe	Tyr	Ser	Gly	Val	Arg	Pro	Ala	

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ATT	GAT	GCT	GGT	345	TCA	TCA	GTA	TCA	CGT	350	GTT	GGT	GGT	GCC	355	GCA	CAA	ATC	1857
Ile	Asp	Ala	Gly	Ser	Ser	Val	Ser	Arg	Val	Gly	Gly	Ala	Ala	Gln	Ile				
AAA	GCC	ATG	AAG	360	AAA	GTA	GCT	GGT	ACT	365	TTG	CGT	CTT	GAC	370	CTT	GCG	TCG	1905
Lys	Ala	Met	Lys	Lys	Val	Ala	Gly	Thr	Leu	Arg	Leu	Asp	Leu	Ala	Ser				
TTC	CGT	GAA	CTT	375	GAA	GCC	TTT	ACA	CAA	380	TTT	GGT	TCT	GAC	385	CTT	GAT	GAA	1953
Phe	Arg	Glu	Leu	Glu	Ala	Phe	Thr	Gln	Phe	Gly	Ser	Asp	Leu	Asp	Glu				
GCG	ACT	CAA	GCA	390	AAA	TTG	AAT	CGT	GGT	400	CGT	ACC	GTT	GAA	GTC	TTG			2001
Ala	Thr	Gln	Ala	Lys	Leu	Asn	Arg	Gly	Arg	Arg	Thr	Val	Glu	Val	Leu	420			
AAA	CAA	CCA	TTG	405	CAC	AAA	CCA	TTG	GCT	415	GTT	GAA	AAA	CAA	GTT	TTG	ATT		2049
Lys	Gln	Pro	Leu	His	Lys	Pro	Leu	Ala	Val	Glu	Lys	Gln	Val	Leu	Ile				
CTC	TAT	GCA	TTG	425	ACT	CAT	GGT	CAT	CTT	430	GAT	AAT	GTT	CCA	GTT	GAT	GAT		2097
Leu	Tyr	Ala	Leu	Thr	His	Gly	His	Leu	Asp	Asn	Val	Pro	Val	Asp	Asp				
GTT	CTT	GAT	TTT	440	GAA	ACT	AAA	ATG	TTC	445	GAT	TTC	TTC	GAT	GCA	AAT	TAT		2145
Val	Leu	Asp	Phe	Glu	Thr	Lys	Met	Phe	Asp	Phe	Phe	Asp	Ala	Asn	Tyr				
GCA	GAT	CTC	TTG	455	AAC	GTA	ATT	ACT	GAC	460	ACT	AAA	GAT	TTG	CCA	GAA	GAA		2193
Ala	Asp	Leu	Leu	Asn	Val	Ile	Thr	Asp	Thr	Lys	Asp	Leu	Pro	Glu	Glu				
GCA	AAA	CTT	GAC	470	GAA	GCA	ATT	AAA	GCA	475	TTC	AAA	AAT	ACA	ACG	AAT	TAT		2241
Ala	Lys	Leu	Asp	Glu	Ala	Ile	Lys	Ala	Phe	Lys	Asn	Thr	Thr	Asn	Tyr	500			
TAATAAGGAG	GCTAACTA	ATG	GGA	485	GCT	TCA	CTT	AAC	GAA	490	ATA	AAA	ACT	AAG					2292
		Met	Gly	Ala	Ser	Leu	Asn	Glu	Ile	Lys	Thr	Lys							
ATT	GCG	TCA	ACA	1	AAG	AAA	ACA	AGT	CAA	5	ATC	ACA	GGT	GCC	ATG	CAA	ATG		2340
Ile	Ala	Ser	Thr	Lys	Lys	Thr	Ser	Gln	Ile	Thr	Gly	Ala	Met	Gln	Met				
GTT	TCT	GCT	GCT	15	AAA	CTT	CAA	AAA	GCA	20	GAA	TCT	CAC	GCT	AAA	GCT	TTT		2388
Val	Ser	Ala	Ala	Lys	Leu	Gln	Lys	Ala	Glu	Ser	His	Ala	Lys	Ala	Phe				
CAG	ACT	TAT	GCT	30	GAA	AAA	GTA	CGT	AAG	35	ATT	ACG	ACT	GAC	TTA	GTT	TCA		2436
Gln	Thr	Tyr	Ala	Glu	Lys	Val	Arg	Lys	Ile	Thr	Thr	Asp	Leu	Val	Ser				
AGC	GAT	AAT	GAG	45	CCG	GCC	AAA	AAT	CCG	50	ATG	ATG	ATT	AAA	CGT	GAA	GTC		2484
Ser	Asp	Asn	Glu	Pro	Ala	Lys	Asn	Pro	Met	Met	Ile	Lys	Arg	Glu	Val	75			
AAG	AAA	ACT	GGC	60	TAT	CTC	GTT	ATC	ACA	65	TCA	GAT	CGT	GGG	CTT	GTT	GGC		2532
Lys	Lys	Thr	Gly	Tyr	Leu	Val	Ile	Thr	Ser	80	Asp	Arg	Gly	Leu	Val	Gly			
AGT	TAT	AAT	TCA	80	AAT	ATT	TTG	AAG	TCT	85	GTT	ATA	AGT	AAT	ATA	CGT	AAA		2580
Ser	Tyr	Asn	Ser	Asn	Ile	Leu	Lys	Ser	Val	100	Ile	Ser	Asn	Ile	Arg	Lys			
CGC	CAC	ACA	AAT	95	GAG	AGT	GAG	TAT	ACA	105	ATA	CTT	GCC	CTT	GGT	GGT	ACG		2628
Arg	His	Thr	Asn	Glu	Ser	Glu	Tyr	Thr	Ile	Leu	Ala	Leu	Ala	Gly	Gly	Thr			
GGA	GCG	GAC	TTT	110	TTC	AAA	GCC	CGT	AAC	115	GTC	AAA	GTT	TCT	TAT	GTT	CTT		2676
Gly	Ala	Asp	Phe	Phe	Lys	Ala	Arg	Asn	Val	Lys	Val	Ser	Tyr	Val	Leu				
CGC	GGA	CTT	TCA	125	GAT	CAA	CCG	ACC	TTT	130	GAA	GAG	GTT	CGG	GCA	ATT	GTT		2724
Arg	Gly	Leu	Ser	Asp	Gln	Pro	Thr	Phe	Glu	Glu	Val	Arg	Ala	Ile	Val	155			
ACA	GAA	GCC	GTA	140	GAA	GAA	TAT	CAA	GCA	145	GAA	GAA	TTC	GAT	GAA	CTC	TAT		2772
Thr	Glu	Ala	Val	Glu	Glu	Tyr	Gln	Ala	Glu	Glu	Phe	Asp	Glu	Leu	Tyr				
GTT	TGT	TAC	AAC	160	CAC	CAT	GTG	AAC	TCA	165	GTA	AGT	GAG	GCA	CGG	ATG			2820
Val	Cys	Tyr	Asn	His	His	Val	Asn	Ser	Leu	Val	Ser	Glu	Ala	Arg	Met				

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GAA AAA ATG TTA CCT ATT TCT TTT GAT GAA AAA GGT GAC GAA AAA GCA	175	180	185	2868
Glu Lys Met Leu Pro Ile Ser Phe Asp Glu Lys Gly Asp Glu Lys Ala				
TCT CTT GTT ACA TTT GAA TTA GAA CCA GAT CGT GAA ACA ATC TTA AAT	190	195	200	2916
Ser Leu Val Thr Phe Glu Leu Glu Pro Asp Arg Glu Thr Ile Leu Asn	205	210	215	
CAG TTG TTG CCG CAA TAT GCT GAA AGT ATG ATT TAT GGC TCA ATT GTT	220	225	230	2964
Gln Leu Leu Pro Gln Tyr Ala Glu Ser Met Ile Tyr Gly Ser Ile Val				
GAT GCA AAA ACA GCA GAA CAT GCT GCA GGT ATG ACC GCA ATG CGT ACT	240	245	250	3012
Asp Ala Lys Thr Ala Glu His Ala Ala Gly Met Thr Ala Met Arg Thr				
GCA ACA GAT AAT GCA CAT TCT GTC ATT AAT GAT TTA ACC ATT CAA TAT	255	260	265	3060
Ala Thr Asp Asn Ala His Ser Val Ile Asn Asp Leu Thr Ile Gln Tyr				
AAC CGT GCT CGT CAA GCT TCA ATT ACG CAA GAA ATT ACG GAA ATT GTT	270	275	280	3108
Asn Arg Ala Arg Gln Ala Ser Ile Thr Gln Glu Ile Thr Glu Ile Val				
GCG GGT GCT TCA GCG CTA TAATTACTGT CAAACATTAT TCTCAATGTT	285			3156
Ala Gly Ala Ser Ala Leu				
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TTTGTTCAGTA AATTTTACT GATTAGCTTA AAAATGAATA GAAATTCTGT TGTTAGACAG				3276
AAAATAAAAA CAGGAGGAAA AACA TTG AGT TCT GGT AAA ATT ACT CAG GTT				3327
Leu Ser Ser Gly Lys Ile Thr Gln Val	1	5		
ATC GGT CCC GTC GTT GAC GTG GAA TTT GGT TCT GAT GCC AAA CTG CCT				3375
Ile Gly Pro Val Val Asp Val Glu Phe Gly Ser Asp Ala Lys Leu Pro	10	15	20	25
GAG ATT AAC AAT GCC TTG ATT GTC TAC AAA GAT GTC AAT GGT TTA AAA				3423
Glu Ile Asn Asn Ala Leu Ile Val Tyr Lys Asp Val Asn Gly Leu Lys				
ACA AAA ATT ACT CTT GAA GTT GCT TTG GAA CTT GGT GAT GGT GCA GTT	30	35	40	3471
Thr Lys Ile Thr Leu Glu Val Ala Leu Glu Leu Gly Asp Gly Ala Val	45	50	55	
CGT ACG ATC GCT ATG GAA TCT ACT GAT GGA TTG ACT CGT GGA CTT GAA	60	65	70	3519
Arg Thr Ile Ala Met Glu Ser Thr Asp Gly Leu Thr Arg Gly Leu Glu				
GTC CTT GAT ACA GGT AAA GCG GTC AGC GTT CCT GTT GGT GAA TCT ACT	75	80	85	3567
Val Leu Asp Thr Gly Lys Ala Val Ser Val Pro Val Gly Glu Ser Thr				
CTT GGT CGT GTT TTT AAT GTC CTT GGT GAC GTT ATT GAT GGT GGA GAA	90	95	100	3615
Leu Gly Arg Val Phe Asn Val Leu Gly Asp Val Ile Asp Gly Gly Glu				
GAT TTC CCT GCT GAT GCA GAA CGT AAT CCT ATC CAC AAG AAA GCT CCA	110	115	120	3663
Asp Phe Pro Ala Asp Ala Glu Arg Asn Pro Ile His Lys Lys Ala Pro				
ACT TTT GAC GAA TTG TCA ACT GCA AAT GAA GTT CTT GTA ACA GGG ATT	125	130	135	3711
Thr Phe Asp Glu Leu Ser Thr Ala Asn Glu Val Leu Val Thr Gly Ile				
AAA GTT GTC GAT TTA CTT GCC CCT TAT CTT AAA GGT GGG AAA GTC GGA	140	145	150	3759
Lys Val Val Asp Leu Leu Ala Pro Tyr Leu Lys Gly Gly Lys Val Gly				
CTC TTC GGT GGT GCC GGT GTT GGT AAA ACC GTC CTT ATC CAA GAA TTG	155	160	165	3807
Leu Phe Gly Gly Ala Gly Val Gly Lys Thr Val Ile Gln Glu Leu				
ATT CAC AAT ATT GCC CAA GAA CAC GGT GGT ATT TCT GTA TTT ACA GGT	170	175	180	3855
Ile His Asn Ile Ala Gln Glu His Gly Gly Ile Ser Val Phe Thr Gly				
GTT GGC GAT CGT ACT CGT GAC GGG AAT GAC CTT TAC TGG GAA ATG AAA				3903
Val Gly Asp Arg Thr Arg Asp Gly Asn Asp Leu Tyr Trp Glu Met Lys				

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GAA	TCA	GGC	GTT	ATT	GAA	AAA	ACA	GCC	ATG	GTC	TTT	GGT	CAA	ATG	AAT	3951				
Glu	Ser	Gly	Val	Ile	Glu	Lys	Thr	Ala	Met	Val	Phe	Gly	Gln	Met	Asn					
			205					210					215							
GAA	CCA	CCT	GGA	GCA	CGT	ATG	CGT	GTT	GCC	CTT	ACT	GGT	TTA	ACA	ATT	3999				
Glu	Pro	Pro	Gly	Ala	Arg	Met	Arg	Val	Ala	Leu	Thr	Gly	Leu	Thr	Ile					
		220					225					230								
GCG	GAA	TAT	TTC	CGT	GAT	GTT	CAA	GGA	CAA	GAC	GTA	TTG	CTT	TTC	ATC	4047				
Ala	Glu	Tyr	Phe	Arg	Asp	Val	Gln	Gly	Gln	Asp	Val	Leu	Leu	Phe	Ile					
		235				240					245									
GAT	AAC	ATC	TTC	CGT	TTC	ACT	CAA	GCT	GGT	TCA	GAA	GTT	TCT	GCC	CTT	4095				
Asp	Asn	Ile	Phe	Arg	Phe	Thr	Gln	Ala	Gly	Ser	Glu	Val	Ser	Ala	Leu					
		250			255					260					265					
TGG	GGA	CGT	ATG	CCT	TCT	GCC	GTT	GGT	TAC	CAA	CCA	ACT	CTT	GCA	ACT	4143				
Trp	Gly	Arg	Met	Pro	Ser	Ala	Val	Gly	Tyr	Gln	Pro	Thr	Leu	Ala	Thr					
				270				275						280						
GAA	ATG	GTT	CAA	TTA	CAG	GAA	CGT	ATC	ACT	TCT	ACT	AAG	AAG	GGT	TCT	4191				
Glu	Met	Val	Gln	Leu	Gln	Glu	Arg	Ile	Thr	Ser	Thr	Lys	Lys	Gly	Ser					
			285					290					295							
GTT	ACA	TCT	ATC	CCA	GCG	ATT	TAT	GTC	CCT	GCC	GAT	GAC	TAT	ACT	GAC	4239				
Val	Thr	Ser	Ile	Pro	Ala	Ile	Tyr	Val	Pro	Ala	Asp	Asp	Tyr	Thr	Asp					
		300					305					310								
CCA	GCG	CCA	GCT	ACA	GCC	TTC	GCT	CAC	TTG	GAC	GCA	ACA	ACT	AAC	TTG	4287				
Pro	Ala	Pro	Ala	Thr	Ala	Phe	Ala	His	Leu	Asp	Ala	Thr	Thr	Asn	Leu					
		315				320					325									
GAA	CGT	CGT	TTG	ACA	CAA	ATG	GGT	ATC	TAT	CCA	GCC	GTT	GAC	CCA	CTT	4335				
Glu	Arg	Arg	Leu	Thr	Gln	Met	Gly	Ile	Tyr	Pro	Ala	Val	Asp	Pro	Leu					
		330			335					340					345					
GCT	TCA	TCA	TCA	CGT	GCG	CTT	ACA	CCT	GAA	ATT	GTT	GGT	GAA	GAA	CAC	4383				
Ala	Ser	Ser	Ser	Arg	Ala	Leu	Thr	Pro	Glu	Ile	Val	Gly	Glu	Glu	His					
				350				355					360							
TAT	GAA	GTT	GCA	ATG	GAA	GTT	CAA	CGT	GTC	CTT	CAA	CGC	TAC	AAA	GAA	4431				
Tyr	Glu	Val	Ala	Met	Glu	Val	Gln	Arg	Val	Leu	Gln	Arg	Tyr	Lys	Glu					
			365					370					375							
TTG	CAA	GAT	ATC	ATT	GCC	ATT	CTT	GGT	ATG	GAT	GAA	TTG	TCA	GAT	GAT	4479				
Leu	Gln	Asp	Ile	Ile	Ala	Ile	Leu	Gly	Met	Asp	Glu	Leu	Ser	Asp	Asp					
		380					385					390								
GAA	AAA	ATT	CTC	GTT	GGA	CGT	GCA	CGT	CGT	ATC	CAA	TTC	TTC	CTT	TCA	4527				
Glu	Lys	Ile	Leu	Val	Gly	Arg	Ala	Arg	Arg	Ile	Gln	Phe	Phe	Leu	Ser					
		395				400					405									
CAA	AAC	TTC	CAC	GTT	GCT	GAA	CAG	TTT	ACT	GGT	CAA	CCT	GGT	TCA	TAT	4575				
Gln	Asn	Phe	His	Val	Ala	Glu	Gln	Phe	Thr	Gly	Gln	Pro	Gly	Ser	Tyr					
		410			415				420						425					
GTA	CCA	ATT	GAC	AAA	ACA	GTT	CAT	GAC	TTC	AAG	GAA	ATT	TTG	GAA	GGT	4623				
Val	Pro	Ile	Asp	Lys	Thr	Val	His	Asp	Phe	Lys	Glu	Ile	Leu	Glu	Gly					
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ACT Thr	GAC Asp	GGT Gly	CAA Gln	ATT Ile	TTC Phe	CTT Leu	GAA Glu	AAT Asn	GAC Asp	TTA Leu	TTC Phe	TAT Tyr	TCA Ser	GGT Gly	GTA Val	192
CGT Arg	CCT Pro	GCC Ala	ATC Ile	GAT Asp	GCT Ala	GGT Gly	TCT Ser	TCA Ser	GTT Val	TCT Ser	CGG Arg	GTT Val	GGT Gly	GGT Gly	GCT Ala	240
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CTT Leu	GCG Ala	TCA Ser	TTC Phe	CGT Arg	GAA Glu	CTT Leu	GAA Glu	GCC Ala	TTT Phe	ACT Thr	CAA Gln	TTT Phe	GGT Gly	TCT Ser	GAT Asp	336
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GTT Val	GAT Asp	GAC Asp	GTC Val	CTT Leu	GAT Asp	TTT Phe	GAA Glu	ACA Thr	AAC Asn	AAT Asn	GTC Val	CGA Arg	TTC Phe	TTC Phe	GAT Asp	528
GCA Ala	AAT Asn	TAT Tyr	GCA Ala	AAA Lys	CTC Leu	TTG Leu	AAC Asn	GTG Val	ATT Ile	ACT Thr	GAA Glu	ACT Thr	AAA Lys	GAT Asp	TGC Cys	576
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ATC Ile	CGT Arg	AAA Lys	CGT Arg	CCT Pro	GCT Ala	AAT Asn	GAA Glu	AGT Ser	GAA Glu	TAT Thr	ACT Thr	ATT Ile	CTT Leu	GCA Ala	CTT Leu	1011
GGC Gly	GGT Gly	ACT Thr	GGA Gly	GCA Ala	GAT Asp	TTC Phe	TTC Phe	GGA Gly	GCA Ala	AGC Ser	AAT Asn	GTT Val	AAA Lys	AGT Ser	TTC Phe	1059

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 Page 9

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